CLASS 372, COHERENT LIGHT GENERATORS

SECTION I - CLASS DEFINITION

This is a restricted class for coherent light generator systems wherein an assembly of electrical, mechanical, and optical components produces an intense, coherent, directional beam of light by stimulating electronic, ionic, or molecular transitions to lower energy levels.

The generators of this system consists of (a) a medium which may be solid, liquid or gaseous, comprising a system of particles, molecules, or atoms; (b) means including a source of energy for setting the particles, molecules, or atoms into an excited energy state; and (c) means to abstract electromagnetic wave energy produced by the relaxation of the system of particles, molecules, or atoms to a lower energy state. The means to abstract electromagnetic wave energy provides for escape from said substance of substantially coherent electromagnetic radiation in the optical or Quasi-optical wavelength range. In general, the wavelength of the emitted radiation lies in the range from the ultraviolet to the far infrared of the electromagnetic spectrum, corresponding to a wavelength range extending from 100 to 2,000,000 angstroms.

The generators of these systems when combined with other diverse systems or devices will be classified with the diverse system or device.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

128, Surgery, appropriate subclasses for lasers used in surgery.

204, Chemistry: Electrical and Wave Energy, in particular subclass 157.41 and 157.61 for the use of lasers in a reaction.

219, Electric Heating, subclass 121.6 for lasers use in electric arc heating.

250, Radiant Energy, subclasses 423+ for lasers used to generate ions; subclasses 281+ for lasers used in ionic separation systems; and subclass 493.1 for other radiant energy generators.

252, Compositions, subclasses 301.16+, 301.36, and 301.4+ for compositions used as the active medium in lasers; and subclasses 372+ for gas compositions used as the active medium in lasers.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclass 13, 79 through 103 and 918, for incoherent light emitting injection luminescent devices, and subclasses 80 through 85 for incoherent semiconductor light emitting sources combined with semiconductor light responsive devices. In general, to avoid excessive duplication of the same patents in both Classes 372 and 257, patents with claims reciting coherent light generators (lasers) are not to be cross-referenced in the aforementioned subclasses in Class 257 unless those patents contain disclosure of a light emitting semiconductor device which is NOT a laser or coherent generator.

356, Optics: Measuring and Testing, appropriate subclasses for lasers used in optical measuring and testing.

359, Optics: Systems (Including Communication) and Elements, subclass 27 for holos:graphic systems having a particular laser source; subclasses 109+ for optical communication systems which may use a laser, subclasses 115+ for optical multiplexing communications systems which utilize lasers, and subclasses 333+ for laser used as amplifiers. Search other subclasses for the lenses, reflectors, etc., used in laser systems.

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclass 103 and 122 for lasers used for nuclear fusion; and subclass 326 for the combination of a laser and a nuclear reactor.

385, Optical Waveguides, subclass 14 for laser in integrated optical circuit.

438, Semiconductor Device Manufacturing: Process, subclasses 22+ for methods of making radiation emissive devices of the semiconductor barrier layer type.

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, particularly subclass 180 for laser generators using high temperature superconducting material.

520, Synthetic Resins or Natural Rubbers.

522, Synthetic Resins or Natural Rubbers, subclass 2 for the use of a laser in preparing or treating a synthetic resin or natural rubber.

708, Electrical Computers: Arithmetic Processing and Calculating, subclass 191 and 800+ for computations which include electro-optic means.

SECTION III - GLOSSARY

ACOUSTO-OPTIC

The effect, on the properties of a beam of light, by sound energy, interacting with the light within a volume of matter.

ACTIVE MEDIA

The material, in which most of the atoms can be placed in an excited state (i.e., population inversion state), so that an electromagnetic wave of the proper frequency passing through it can stimulate a cascade of photons.

BIREFRINGENT

The property of dividing a ray of light into two polarized rays (known as the ordinary and extraordinary rays), the directions of polarization of the rays being at right angles to each other.

COHERENT LIGHT

A single frequency of light. A light beam in which the electric vector at any point in it is related to that at any other point by a definite, continuous sinusoidal function.

DIFFRACTION

The bending of a light ray in passing the edge formed by contiguous opaque and transparent areas.

ELECTRO-OPTIC

The effect, on the properties of a beam of light, by an electrical field, interacting with the light within a volume of matter.

GLOW DISCHARGE

A type of discharge in which a uniform glow is created through the entire volume of a gaseous active media rather than a channel or spark discharge through a restricted portion of the active media.

INTERFERENCE

The interaction of two light waves which, as a result of their relative phases, produce a cancellation or reinforcement of wave energy.

LASER

A device for generating a very narrow, intense beam of coherent light. The name is derived from the initial letters of "Light Amplification by Stimulated Emission of Radiation". In the emission of ordinary light the molecules or atoms of the source emit their radiation independently of each other, and consequently there is no definite phase relationship among the vibrations in the resultant beam. The light is incoherent. The laser, by means of an optical resonator, forces the atoms of the material within the resonator to radiate in phase. The emitted radiation is stimulated by the excitation of atoms to a higher energy level by means of energy supplied to the device.

LIGHT

In this class, light includes not only optical wavelengths, i.e., that part of the spectrum extending from the near infrared, through the visible, to the ultraviolet, but also includes those portions of the spectrum which extends from the near infrared through the long wavelength, far infrared, and from the ultraviolet to X-rays and gamma rays at the shortest wavelengths.

LIGHT, VISIBLE LIGHT

Visible light is radiation which stimulates the optical receptors of the eye, and having a wavelength from 3850 to 7600 Angstrom units. The term light is used to refer to wavelengths in the above-mentioned range and, often, also to refer to the ranges immediately adjacent, i.e., the ultraviolet and infrared ranges which are nonvisible.

MODE

One of several states of electromagnetic wave oscillation that may be sustained in a given resonant system. Each type of vibration is designated as a particular mode, and has its own particular frequency and electric and magnetic field configurations.

OPTICS, OPTICAL

The science of light and vision and the construction of optical instruments.

OPTICAL ELEMENT

A structure which performs a basic optical function, i.e., the structure when exposed to or placed in the path of a

group of light rays will cause a deviation of the rays in accordance with a regular pattern, a blocking of the rays, or a modification in the character or properties of the light.

OPTICAL FIBER

A light guidance system that is cylindrical in shape. The fiber relies upon modal transmission to transmit light along its axial length. Light enters one end of the fiber and emerges from the opposite end with only minimal loss.

OPTICAL SYSTEM

A combination of two or more similar or diverse optical elements which are optically related.

REFLECTION

Light striking a surface and returning back into the medium from which it came.

REFRACTION

The deviation of light which results when a ray of light passes obliquely from a medium of one density to a medium of another density.

RESONANT CAVITY

A mode-selecting low-loss optical structure in which the laser action takes place by the build-up of electromagnetic field intensity upon multiple reflection.

SEMICONDUCTOR

An electronic conductor, with resistivity between that of metals and that of insulators, in which the electrical charge carrier concentration increases with increasing temperature over some temperature range. Over most of the practical temperature range, the resistance has a negative temperature coefficient. Certain semiconductors possess two types of carriers, negative electrons and positive holes. The charge carriers are usually electrons, but there may be also some ionic conductivity.

SEMICONDUCTOR LASER

A light-emitting diode that uses stimulated emission to produce a coherent light output.

SPECTRUM

The band of colors produced by separating a beam of white light into its component frequencies.

THIN FILM

A film of optically transparent material, usually deposited by sputtering or evaporation, that may be made in a pattern on a substrate or used as insulation between successive layers of components, and generally on the order of a few wavelengths thick.

THIN FILM WAVEGUIDE

A thin dielectric guide film of high refractive index formed adjacent to a substrate or support region of lower refractive index. The thin film relies upon modal transmission to transmit light along its length. Light enters one end of the thin film where it is processed (e.g., modulated or switched) and emerges from the opposite end.

WAVEGUIDE

A system of material boundaries capable of guiding electromagnetic wave. A transmission line comprising a hollow conducting tube within which electromagnetic waves are propagated on a solid dielectric or dielectric-filled conductor.

SUBCLASSES

1 SUPER RADIANT LASER:
This subclass is indented under the class definition. Subject matter wherein coherent light is generated in an inverted medium without the use of cavity feedback.

2 FREE ELECTRON LASER:
This subclass is indented under the class definition. Subject matter wherein laser action is accomplished by sending a relativistic electron beam through a spatially periodic transverse magnetic field.

SEE OR SEARCH THIS CLASS, SUBCLASS:

74, for lasers which are pumped by an electron beam.

3 RAMAN LASER:
This subclass is indented under the class definition. Subject matter in which the coherent light is generated as a direct result of the excitation of stimulated Raman scattering.

4 LONG WAVELENGTH (E.G., FAR INFRARED):
This subclass is indented under the class definition. Subject matter wherein the wavelength of the generated light is generally greater than 10 microns.

5 SHORT WAVELENGTH LASER:
This subclass is indented under the class definition. Subject matter wherein the wavelength of the generated light is generally less than 400 nanometers (.4 microns).

6 OPTICAL FIBER LASER:
This subclass is indented under the class definition. Subject matter in which the laser is constructed in the form of an optical fiber.

7 THIN FILM LASER:
This subclass is indented under the class definition. Subject matter wherein the active media of the laser is in the form of a thin film.

8 LASER LOGIC SYSTEM:
This subclass is indented under the class definition. Subject matter where an optical logic function is performed by a laser system.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclass 191 for digital computations which include electro-optical means.

9 PARTICULAR BEAM CONTROL DEVICE:
This subclass is indented under the class definition. Subject matter wherein means is provided for controlling some characteristic or parameter of the output beam, such as its amplitude, frequency, pulse rate, direction, etc., and wherein the control is effected prior to the beam's actual departure from the resonant cavity of the laser.

SEE OR SEARCH CLASS:
330, Amplifiers, subclass 4.3 for modulation of the laser beam after it departs the resonant cavity.
359, Optics: Systems (Including Communication) and Elements, appropriate subclasses for optical devices such as modulators, beam scanners, etc., which may be used as light control devices.

10 Q-switch:
This subclass is indented under subclass 9. Subject matter wherein the beam control device alters the losses of a laser cavity for the purpose of generating giant pulses.

11 Absorption type:
This subclass is indented under subclass 10. Subject matter wherein the Q-switch is made of a passive material which exhibits an absorptivity that changes with increasing irradiance.

12 Electro-optic:
This subclass is indented under subclass 10. Subject matter wherein the beam control device includes a material which exhibits an electro-optic effect and has some means of applying an electric field across that material.

13 Acousto-optic:
This subclass is indented under subclass 10. Subject matter wherein the beam control device includes a material which exhibits an acousto-optic effect and provides some means for creating an acoustic wave within that material.

14 Mechanical:
This subclass is indented under subclass 10. Subject matter wherein the beam control device utilizes mechanical means to alter the Q of the cavity.

15 Rotating mirror:
This subclass is indented under subclass 14. Subject matter wherein the mechanical means is a rotating mirror.

16 Rotating prism:
This subclass is indented under subclass 14. Subject matter wherein the mechanical means is a rotating prism.

17 Plural Q-switches:
This subclass is indented under subclass 10. Subject matter wherein the Q-switched laser includes more than one Q-switch, either of the same type or of different types.

18 Mode locking:
This subclass is indented under subclass 9. Subject matter wherein means is provided for applying to the laser resonator a time-varying perturbation at or near the frequency which corresponds to the average axial mode spacing of the laser, so as to establish a phase relationship between the oscillatory laser modes, resulting in a laser output in the form of a periodic pulse train whose repetition rate is equal to the frequency of the perturbation.

19 Mode discrimination:
This subclass is indented under subclass 9. Subject matter wherein means is provided for either enhancing or suppressing particular modes of oscillation within the resonant cavity.

20 Tuning:
This subclass is indented under subclass 9. Subject matter wherein means is provided for selectively varying the output wavelength of the laser.

21 Nonlinear device:
This subclass is indented under subclass 9. Subject matter including an optical device which has an output that does not rise or fall in direct proportion to the input.

22 Frequency multiplying (e.g., harmonic generator):
This subclass is indented under subclass 21. Subject matter in which the nonlinear device provides an output beam whose frequency is a multiple of the frequency of the input beam.

23 Producing plural wavelength output:
This subclass is indented under subclass 9. Subject matter wherein the output is characterized as having a plurality of discrete wavelengths.

24 Scanning:
This subclass is indented under subclass 9. Subject matter including means for providing a directional scan of the output beam as it exits the laser cavity.

25 Control of pulse characteristics:
This subclass is indented under subclass 9. Subject matter wherein means is provided for selection or variation of pulse characteristic, i.e., pulse shape, pulse repetition rate, etc.

26 Modulation:
This subclass is indented under subclass 9. Subject matter wherein means is provided internal of the resonant cavity for modifying some characteristic of the laser output beam so that it varies in step with the instantaneous value of a modulating wave or signal.

SEE OR SEARCH CLASS:
330, Amplifiers, subclass 4.3, subclass 7.51 for laser modulators in which the means modifying the output beam is positioned external of the resonant cavity.

27 Polarization:
This subclass is indented under subclass 26. Subject matter wherein the characteristic modified is the polarization of the output beam.

28 Frequency:
This subclass is indented under subclass 26. Subject matter wherein the characteristic modified is the frequency of the output beam.

29.01 Having particular beam control circuit component:
This subclass is indented under subclass 9. Subject matter comprising a specific electrical component or a group of electrical components that control a light beam.

29.011 Feedback circuitry:
This subclass is indented under subclass 29.01. Subject matter wherein a fraction of an output signal from the specific electrical component or group of electrical components is returned to input.

29.012 Power supply:
This subclass is indented under subclass 29.01. Subject matter wherein the specific electrical component or group of electrical components is a source of power for the coherent light generator.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, various subclasses for electrical power supply, per se.

29.013 Having particular electrode structure:
This subclass is indented under subclass 29.01. Subject matter wherein an electrical component that (1) emits or collects electrons or ions or (2) controls electron or ion movement by means of an electric field for a beam control device and has specific details.

29.014 Controlling light intensity:
This subclass is indented under subclass 29.01. Subject matter wherein the electrical component or collection of electrical components are specially designed to regulate a magnitude of an optical output.

29.015 Controlling current or voltage:
This subclass is indented under subclass 29.01. Subject matter wherein the electrical component or collection of electrical components are specifically designed to regulate a supply of current or voltage to the coherent light generator.

29.016 Controlling beam phase:
This subclass is indented under subclass 29.01. Subject matter wherein the electrical component or collection of electrical components are specifically designed to regulate angular relationship between current and voltage.

29.02 Optical output stabilization:
This subclass is indented under subclass 9. Subject matter comprising means for maintaining a constant level for a parameter or characteristic of an optical output.

29.021 Power:
This subclass is indented under subclass 29.02. Subject matter wherein a parameter of dissipated energy or power is maintained at a constant level.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, various subclasses for electrical power supply, per se.

29.022 Cavity:
This subclass is indented under subclass 29.02. Subject matter wherein a resonant cavity is controlled to maintain a constant level of optical output stabilization.

29.023 Phase:
This subclass is indented under subclass 29.02. Subject matter wherein a parameter or characteristic of phase is controlled to maintain a constant level of optical stabilization.

30 Pulse:
This subclass is indented under subclass 29.02. Subject matter wherein the output of the laser is pulsed and some parameter characteristic of the pulse is stabilized such as pulse width, pulse repetition rate, etc.

31 Amplitude:
This subclass is indented under subclass 29.02. Subject matter wherein the stabilized parameter is the amplitude.

32 Frequency:
This subclass is indented under subclass 29.02. Subject matter wherein the stabilized parameter is the frequency.

33 PARTICULAR OPERATING COMPENSATION MEANS:
This subclass is indented under the class definition. Subject matter including means to overcome an effect which is deleterious to the operation of the laser.

(1) Note. For example, means for compensating for parasitic oscillation, thermal lensing, etc.

34 PARTICULAR TEMPERATURE CONTROL:
This subclass is indented under the class definition. Subject matter including means for controlling the temperature of the laser or the temperature of its component parts.

35 Liquid coolant:
This subclass is indented under subclass 34. Subject matter including a liquid coolant.

36 Heat sink:
This subclass is indented under subclass 34. Subject matter including details of a heat sink.

37 HAVING AN APPLIED MAGNETIC FIELD:
This subclass is indented under the class definition. Subject matter including means for applying a magnetic field to some portion of the laser.

38.01 Having feedback circuitry:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry returns a fraction of an output signal to an input.

38.02 For driving or controlling laser:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry is used to drive or control a laser function of the coherent light generator.

38.03 Switch (e.g., thyratron, etc.):
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry is a switch.

SEE OR SEARCH CLASS:
200, Electricity: Circuit Makers and Breakers, various subclasses for electrical switches, per se.

38.04 Power supply:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry is a source of power for the coherent light generator.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, various subclasses for electrical power supply, per se.

38.05 Electrode:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry contains details of a conducting element that (1) emits or collects electrons or ions or (2) controls the movement of electrons or ions by means of an electric field for the coherent light generator.

38.06 Optical pumping:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry controls flashing means of the coherent light generator.

38.07 Controlling current or voltage to laser:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry regulates the supply of current or voltage to the coherent light generator.

38.08 Having noise suppression circuitry:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry reduces or eliminates undesired signals.

38.09 Having fault protection circuitry:
This subclass is indented under subclass 38.1. Subject matter wherein the particular component circuitry causes the coherent light generator to cease operation or change an operating characteristic in response to a sensed nonstandard operating condition.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclasses 1 through 138 for safety and protection of electrical devices, per se.

38.1 PARTICULAR COMPONENT CIRCUITRY:
This subclass is indented under the class definition. Subject matter comprising specific circuitry for operating components of the coherent light generator.

(1) Note. This subclass includes pulse forming networks for driving a flash lamp, Q-switch, or modulator.

39 PARTICULAR ACTIVE MEDIA:
This subclass is indented under the class definition. Subject matter wherein the media in which most of the atoms can be placed in an excited state (i.e., population inversion state), so that an electromagnetic wave of the proper

frequency passing through the media can stimulate a cascade of photons, is specified.

40 Amorphous (e.g., glass):
This subclass is indented under subclass 39. Subject matter where the solid active media does not have a definite crystalline structure.

41 Insulating crystal:
This subclass is indented under subclass 39. Subject matter where the solid active media is an electrically nonconductive composition of matter having definite crystalline structure.

42 Utilizing color centers:
This subclass is indented under subclass 41. Subject matter wherein color centers are formed within the crystal material which consist of displaced electrons that are trapped in regions of positive charge or of a "hole" or region of electron deficiency, which behaves like a "negative electron" or "positive hole", which can be trapped or localized in well-defined sites and which can impart color to the crystal material.

43 Semiconductor:
This subclass is indented under subclass 39. Subject matter wherein the active media is a semiconductor.

44 Injection:
This subclass is indented under subclass 43. Subject matter wherein the laser is a p.n junction semiconductor device which converts forward-bias electrical input directly into coherent optical output power via a process of stimulated emission in the region near the junction.

SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclass 13, 79 through 103 and 918 for incoherent light emitting injection luminescent devices, and subclasses 80 through 85 for semiconductor light emitting sources combined with semiconductor light responsive devices.
438, Semiconductor Device Manufacturing: Process, subclasses 22+ for methods of making radiation emissive devices of the semiconductor barrier layer type.

45 Particular confinement layer:
This subclass is indented under subclass 44. Subject matter wherein there is present a layer specifically designed to provide for carrier and/or radiation confinement.

46 Particular current control structure:
This subclass is indented under subclass 44. Subject matter wherein there is a means which is specifically designed to provide for control of the current flow in the area of the active region.

47 Transverse junction:
This subclass is indented under subclass 46. Subject matter wherein the p.n junction is transverse to the active layer.

48 Channeled substrate:
This subclass is indented under subclass 46. Subject matter wherein the substrate has a channel in the substrate region adjacent the active region.

49 Particular coating on facet:
This subclass is indented under subclass 44. Subject matter having a specified coating on at least one facet.

50 Monolithic integrated:
This subclass is indented under subclass 44. Subject matter wherein the laser is monolithically integrated with another laser or with other semiconductor devices which form an integral part of the laser.

51 Liquid:
This subclass is indented under subclass 39. Subject matter wherein the physical state of the active media is a liquid.

52 Chelate:
This subclass is indented under subclass 51. Subject matter where the liquid active media is in the form of a solution of a material having a trivalent rare earth bonded to several organic groups or liquids and dissolved in a suitable solvent.

SEE OR SEARCH THIS CLASS, SUBCLASS:
40, for rare-earth chelates dissolved in a solid plastic host material.

53 Dye:
This subclass is indented under subclass 51. Subject matter where the liquid active media is a dye media dissolved in a suitable solvent.

SEE OR SEARCH THIS CLASS, SUBCLASS:
40, for an active media including a dye dissolved in a solid plastic host material.

54 Particular structural features:
This subclass is indented under subclass 51. Subject matter including particular structure for containing or transporting the liquid active media through the laser.

55 Gas:
This subclass is indented under subclass 39. Subject matter wherein the active media is in a gaseous form.

56 Metal vapor:
This subclass is indented under subclass 55. Subject matter wherein the gas is a vaporized metal.

57 Excimer or exciplex:
This subclass is indented under subclass 55. Subject matter wherein the active media is a dimer or hetero nuclear complex, which is bound in the excited state and free or essentially free in the lower state.

58 With means for controlling gas flow:
This subclass is indented under subclass 55. Subject matter having means for moving gas through an activation area.

59 Gas maintenance (e.g., purification, replenishment, etc.):
This subclass is indented under subclass 55. Subject matter including means for maintaining the operational level of the active medium.

60 Including a specified gas additive:
This subclass is indented under subclass 55. Subject matter wherein a gas different from the active medium is added to the active medium.

61 Discharge tube feature:
This subclass is indented under subclass 55. Subject matter including a discharge tube having a specified feature.

SEE OR SEARCH CLASS:
313, Electric Lamp and Discharge Devices, appropriate subclasses for discharge devices, per se.

62 Segmented:
This subclass is indented under subclass 61. Subject matter wherein the means which confines the discharge is formed of individual segments.

63 Backflow feature:
This subclass is indented under subclass 61. Subject matter having gas flow means which bypasses the discharge path.

(1) Note. A use of this means is, for example, pressure and equalization.

64 Waveguide:
This subclass is indented under subclass 61. Subject matter wherein a waveguide resonator provides the necessary feedback to establish oscillation.

65 Support:
This subclass is indented under subclass 61. Subject matter including particular support means for the discharge tube.

66 Active media with particular shape:
This subclass is indented under subclass 39. Subject matter where the active media has a particular distinguishing shape.

67 Disc-shaped active media:
This subclass is indented under subclass 66. Subject matter where the active media has a cross sectional dimension which is substantially greater than its thickness.

68 Plural active media or active media having plural dopants:
This subclass is indented under subclass 39. Subject matter where the active media exists as two or more separate and distinct bodies or as a single body doped with ions of two or more different chemical elements.

69 PARTICULAR PUMPING MEANS:
This subclass is indented under the class definition. Subject matter in which a particular mechanism is set forth for exciting the active media.

70 Pumping with optical or radiant energy:
This subclass is indented under subclass 69. Subject matter in which the pumping means excites the active media with optical or radiant energy.

71 End-pump laser:
This subclass is indented under subclass 70. Subject matter in which the active media is excited by optical or radiant energy directed through an end surface of the active media.

72 Pump cavity:
This subclass is indented under subclass 70. Subject matter in which the pumping means is included within a housing which interacts with the pumping means so as to enhance its operation as, for example, by cooling the pumping means, filtering out undesirable wavelengths, focusing the radiation, etc.

73 High-energy particles:
This subclass is indented under subclass 70. Subject matter in which the pumping means is a nuclear reactor, radioactive material, or other source of high-energy particle radiation capable of exciting the active media.

74 Electron beam:
This subclass is indented under subclass 73. Subject matter in which the high-energy particles take the form of an electron beam.

75 Semiconductor:
This subclass is indented under subclass 70. Subject matter in which the pumping means is a light emitting semiconductor device.

76 Plasma:
This subclass is indented under subclass 70. Subject matter in which the pumping means is an ionized gas of sufficient temperature to radiate electromagnetic energy.

77 Exploding or combustible material:
This subclass is indented under subclass 70. Subject matter in which the pumping means is in the form of a material which burns or explodes giving up energy which excites the active media.

78 Heat:
This subclass is indented under subclass 70. Subject matter in which the pumping means is a source of heat, and heat, per se, excites the active media.

(1) Note. Where heat is not the primary form of the exciting energy but merely appears in the spectral range of the radiant energy generated by the pump source, search appropriate subclasses under subclass 70 for the particular energy source.

79 Solar:
This subclass is indented under subclass 70. Subject matter in which the ultimate source of the pump energy is the sun.

80 Excited phosphor:
This subclass is indented under subclass 70. Subject matter in which the pumping means comprises a phosphor excited or energized by any of the various forms of radiations and which, on excitation, will provide a characteristic emission matched to the desired input of the laser.

81 Electrical:
This subclass is indented under subclass 69. Subject matter in which the pumping means creates an electrical discharge through the active media which directly excites the active media.

SEE OR SEARCH THIS CLASS, SUBCLASS:
43+, for electrical excitation of semiconductor lasers.

82 Inductive or capacitive excitation:
This subclass is indented under subclass 81. Subject matter in which electrical energy is introduced into the electrical discharge path by means of an inductive or capacitive coupling mechanism.

83 Transversely excited:
This subclass is indented under subclass 81. Subject matter in which the electrical energy creating the electrical discharge is introduced into the active media transverse to the optical axis of the laser.

84 Traveling wave:
This subclass is indented under subclass 83. Subject matter in which the electric discharge is obtained through a progressive wave of current being propagated in a gaseous active medium from one end of the discharge channel to the other.

85 Glow discharge:
This subclass is indented under subclass 81. Subject matter in which a uniform glow-type discharge through the entire volume of a gaseous active media is created rather than a channel or spark discharge.

86 Having an auxiliary ionization means:
This subclass is indented under subclass 81. Subject matter in which the apparatus includes more than one means for ionizing at least a portion of the active media prior to or at the same time as the electrical discharge which directly excites the active media.

87 Having particular electrode structure:
This subclass is indented under subclass 81. Subject matter in which at least one electrode has particular structure.

88 Hollow electrode:
This subclass is indented under subclass 87. Subject matter wherein at least one of the electrodes is hollow.

89 Chemical:
This subclass is indented under subclass 69. Subject matter wherein the excitation of the active media results from the direct production of the excited states by a chemical reaction.

90 Gas dynamic:
This subclass is indented under subclass 69. Subject matter wherein the necessary conditions for lasing are created solely by a thermal expansion of the laser gas media to supersonic flow speeds.

91 With depopulation of lower states:
This subclass is indented under subclass 69. Subject matter wherein the specified pumping means includes means for selectively depumping a lower level to achieve the required population inversion.

92 PARTICULAR RESONANT CAVITY:
This subclass is indented under the class definition. Subject matter including particulars of a mode-selecting low-loss optical structure in which the laser action takes place by the build-up of electromagnetic field intensity upon multiple reflection.

93 Folded cavity:
This subclass is indented under subclass 92. Subject matter wherein the cavity is folded or includes reflective surfaces or other optical structures for bending the optical axis of the resonant cavity.

94 Having a ring configuration:
This subclass is indented under subclass 93. Subject matter wherein the cavity is in the configuration of a ring or closed loop.

95 Unstable resonator:
This subclass is indented under subclass 92. Subject matter in which the resonant cavity is designed so that radiation, upon repeated reflection between the primary and feedback reflection surfaces, will progressively move transversely of the optical axis until it clears an edge of the feedback reflector and escapes from the cavity as output radiation.

96 Distributed feedback:
This subclass is indented under subclass 92. Subject matter in which the feedback structure comprising the resonant cavity is distributed through and integrated with the active medium of the laser and is created by substantially time constant, spatially periodic perturbations in the transmission characteristics of the medium along the length thereof, which may take the form of variations in the gain, index of refraction, propagation constant, or other parameter of the medium.

97 **Plural cavities:**
This subclass is indented under subclass 92. Subject matter including at least two resonant cavities.

98 **Specified cavity component:**
This subclass is indented under subclass 92. Subject matter wherein a particular cavity component or particular component within the cavity is specified.

99 **Reflector:**
This subclass is indented under subclass 98. Subject matter wherein the specified component has a surface which is reflective or partially reflective.

100 **Prism:**
This subclass is indented under subclass 98. Subject matter wherein the specified component is a geometric solid figure whose end faces are congruent polygons, and whose sides are parallelograms.

101 **Lens or lens system:**
This subclass is indented under subclass 98. Subject matter wherein the specified component is a lens or a system of lenses.

102 **Grating:**
This subclass is indented under subclass 98. Subject matter wherein the specified component has a periodic structure capable of dispersing light in accordance with its wavelength.

(1) Note. For example the periodic structure may consist of alternate opaque and transparent sections, alternate reflecting and nonreflecting sections, or alternate high index of refraction and low index of refraction sections.

103 **Window, aperture and mask:**
This subclass is indented under subclass 98. Subject matter wherein the specified component is an opening for admission of light, or a transparent cover.

104 **Aerodynamic window:**
This subclass is indented under subclass 103. Subject matter wherein the window is formed by a window gas driven at a high, jet stream velocity across the laser beam such that the jet streams serve the same function as a solid window.

105 **Birefringent material:**
This subclass is indented under subclass 98. Subject matter wherein the specified component includes a material exhibiting birefringent properties.

106 **Polarizer:**
This subclass is indented under subclass 98. Subject matter wherein the specified component is a device which produces polarized rays.

107 **Mirror support or alignment structure:**
This subclass is indented under subclass 92. Subject matter including significant details of structure for support or alignment of a mirror.

108 **Specified output coupling device:**
This subclass is indented under subclass 92. Subject matter including significant details of an output coupling device.

109 **MISCELLANEOUS:**
This subclass is indented under the class definition. Subject matter not provided for in any of the preceding subclasses of this class.

CROSS-REFERENCE ART COLLECTIONS

700 **Optical delay:**
Subject matter including disclosure of means for optically subjecting coherent light to a time delay.

701 **Nozzle:**
Subject matter including disclosure of a nozzle which may be used to influence the flow of an active media in a coherent light generator.

702 **Isotope:**
Subject matter which includes disclosure of the interaction of coherent light and isotopes.

703 **Optical isolater:**
Subject matter wherein there is disclosure of an optical means for isolating coherent light.

704 **Summary reference:**
Subject matter wherein there is a summary statement of coherent light generation means or prior art devices.

705 Neat thing:
Subject matter which includes disclosure of an unusual feature or utilization of a coherent light generator.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 Output stabilization:
This subclass is indented under subclass 9. Foreign art collections including means for stabilizing a parameter or characteristic of the output.

FOR 101 WITH PARTICULAR COMPONENT CIR:
This subclass is indented under the class defini. Foreign art collections including particular cir for operating specific components of the generator.

(1) Note. Included are, for example, pulse forming networks for driving the flash lamp, Q-switch or modulator, light detection and feedback for stabilizing frequency amplitude, etc.

END